XXIV. *Advertiſement of the expected Return of the Comet of 1532 and 1661 in the Year 1788. By the Rev.* Nevil Maſkelyne, *D. D. F. R. S. and Aſtronomer Royal.*

Read June 29, 1786.

THE comet of 1531, 1607, and 1682, having returned in the year 1759, according to Dr. HALLEY's prediction in his *Synopſis Aſtronomiæ Cometicæ*, firſt publiſhed in the Philoſophical Tranſactions in 1705, and re-publiſhed with his Aſtronomical Tables in 1749, there is no reaſon to doubt that all the other comets will return after their proper periods, according to the remark of the ſame author.

In the firſt edition of the *Synopſis* he ſuppoſed the comets of 1532 and 1661, from the ſimilarity of the elements of their orbits, to be one and the ſame; but in the ſecond edition he has ſeemed to leſſen the weight of his firſt conjecture by not repeating it. Probably he thought it beſt to eſtabliſh this new point in aſtronomy, the doctrine of the revolution of comets in elliptic orbits, as all philoſophical matters in the beginning ſhould be, on the moſt certain grounds; and feared that the vague obſervations of the comet, made by APIAN in 1532, might rather detract from, than add to, the evidence ariſing from more certain *data*. Aſtronomers, however, have generally acquieſced in his firſt conjecture of the comets of 1532 and 1661 being one and the ſame, and to expect its return to its perihelium accordingly in 1789.

The

The interval between the paſſages of the comet by the perihelium in 1532 and 1661 is 128 years, 89 days, 1 hour, 29 minutes (32 of the years being biſſextile), which added to the time of the perihelium in 1661, together with 11 days to reduce it from the Julian to the Gregorian ſtile, which we now uſe, brings out the expected time of the next perihelium to be April 27th, 1 h. 10′ in the year 1789.

The periodic times of the comet, which appeared in 1531, 1607, and 1682, having been of 76 and 75 years alternately, Dr. HALLEY ſuppoſed, that the ſubſequent period would be of 76 years, and that it would return in the year 1758; but, upon conſidering its near approach to Jupiter, in its deſcent towards the ſun in the ſummer of 1681, he found, that the action of Jupiter upon the comet was, for ſeveral months together, equal to one-fiftieth part of the ſun upon it, tending to increaſe the inclination of the orbit to the plane of the ecliptic, and lengthen the periodic time. Accordingly, the inclination of the orbit was found by the obſervations made in the following year 1682 to be 22′ greater than in the year 1607. The effect of the augmentation of the periodic time could not be ſeen till the next return, which he ſuppoſed would be protracted by Jupiter's action to the latter end of the year 1758, or the beginning of 1759. M. CLAIRAUT, previous to its return, took the pains to calculate the actions both of Jupiter and Saturn on it during the whole periods from 1607 to 1682, and from 1682 to 1759, and thence predicted its return to its perihelium by the middle of April; it came about the middle of March, only a month ſooner, which was a ſufficient approximation to the truth in ſo delicate a matter, and did honour to this great mathematician, and his laborious calculations.

The comet in queſtion is alſo, from the poſition of its orbit, liable to be much diſturbed both by Jupiter and Saturn, particularly in its aſcent from the ſun after paſſing its perihelium, if they ſhould happen to be near it, when it appoaches to or croſſes their orbits; becauſe it is very near the plane of them at that time. When it paſſed the orbit of Jupiter in the beginning of February 1682, O. S. it was 50° *in conſequentia* of that planet; and when it paſſed the orbit of Saturn in the beginning of October 1663, it was 17° *in conſequentia* of it. Hence its motion would be accelerated while it was approaching towards the orbit of either planet by its ſeparate action, and retarded when it had paſſed its orbit; but, as it would be ſubjected to the effect of retardation through a greater part of its orbit than to that of acceleration, the former would exceed the latter, and conſequently the periodic time would be ſhortened; but probably not much, on account of the conſiderable diſtance of the comet from the planets when it paſſed by them; and therefore we may ſtill expect it to return to its perihelium in the beginning of the year 1789, or the latter end of the year 1788, and certainly ſome time before the 27th of April 1789. But of this we ſhall be better informed after the end of this year, from the anſwers to the prize queſtion propoſed by the Royal Academy of Sciences at Paris, to compute the diſturbances of the comet of 1532 and 1661, and thence to predict its return *.

---

* Since this was written, I received the unwelcome news, in a letter from M. MECHAIN, of the Royal Academy of Sciences at Paris, that the Academy has not received ſatisfactory anſwers concerning the diſturbances of the comet between 1532 and 1661, and 1661 and the approaching return, and that the prize is referred to be adjudged of at Eaſter 1788, and that it will be 6000 livres. N. M.

If it ſhould come to its perihelium on the 1ſt of January 1789, it might probably be viſible, with a good achromatic teleſcope, in its deſcent to the ſun, the middle of September 1788, and ſooner or later, according as its perihelium ſhould be ſooner or later. It will approach us from the ſouthern parts of its orbit, and therefore will firſt appear with conſiderable ſouth latitude and ſouth declination; ſo that perſons reſiding nearer the equator than we do, or in ſouth latitude, will have an opportunity of diſcovering it before us. It is to be wiſhed that it may be firſt ſeen by ſome aſtronomer in ſuch a ſituation, and furniſhed with proper inſtruments for ſettling its place in the heavens, the earlieſt good obſervations being moſt valuable for determining its elliptic orbit, and proving its identity with the comets of 1532 and 1661. The Cape of Good Hope would be an excellent ſituation for this purpoſe.

In order to aſſiſt aſtronomers in looking out for this comet, I have here given its heliocentric and geocentric longitudes and latitudes and correſpondent diſtances from the ſun and earth, on ſuppoſition that it ſhall come to its perihelium on January 1, 1789. But if that ſhould happen ſooner or later, the heliocentric longitudes and latitudes and diſtances from the ſun will ſtand good if applied to days as much earlier or later, as the time of the perihelium may happen ſooner or later; and the geocentric longitudes and latitudes and diſtances from the earth muſt be re-computed accordingly. The calculations are made for a parabolic orbit from the elements determined by Dr. HALLEY from HEVELIUS's obſervations in 1661, only allowing for the preceſſion of the equinoxes. The elements made uſe of were as follows:

Time of perihelium January 1, 1789, at noon.

Perihelium diſtance 0,44851.

Place

Place of aſcending node 2^s 24° 18′.

Inclination of orbit to the ecliptic 32° 36′.

Perihelium forwarder in orbit than the aſcending node 33° 28′.

It motion is direct.

Computed places of the comet, on ſuppoſition that it ſhall return to its perihelium January 1, 1789, at noon.

Times.	Diſt. from ⊙.	Diſt. from the earth.	Heliocentric longitude.			Heliocentric latitude.			Geocentric longitude.			Geocentric latitude.			Product of diſtances from ⊙ nd earth.
1788			S.	D.	M	D.	M.		S.	D.	M.	D.	M.		
Apr. 23, 7	4, 0	4,52	11	3	54	30	56	S	11	16	30	27	5	S	18,07
June 4, 1	3, 5	3,54	11	7	6	31	25		11	26	31	31	4		12,38
July 14, 5	3,	2,57	11	11	16	31	55		0	3	21	38	11		7,70
Aug. 2,46	2,75	2,15	11	13	47	32	10		0	4	8	42	59		5,90
— 20,43	2, 5	1,79	11	16	39	32	22		0	2	0	48	16		4,48
Sept. 7, 3	2,25	1,51	11	20	9	32	32		11	25	6	53	28		3,39
— 24, 0	2,	1,29	11	24	16	32	36		11	13	12	56	45		2,58
Oct. 10,26	1,75	1,13	11	29	24	32	30		10	28	22	56	36		1,75
— 26,64	1,50	1,01	0	5	51	32	4		10	15	50	52	6		1,51
Nov. 9,34	1,25	0,88	0	14	19	31	0		10	8	36	46	47		1,10
— 23,39	1, 0	0,76	0	26	4	28	32		10	4	10	39	0		0,76
Dec. 7,21	0,75	0,62	1	13	58	22	29		9	29	18	27	45		0,46
— 23,32	0,50	0,50	2	20	58	2	8		9	14	31	2	7	S	0,25
— 24,35	0,49	0,51	2	24	18	0	0		9	12	58	0	0		0,25
1789															
Jan. 1, 0	0,45	0,59	3	23	25	17	17	N	9	2	50	13	8	N	0,26

The laſt obſervation made by HEVELIUS on the comet in 1661 was when its diſtance from the earth was 0,986, and from the ſun 1,37, with what he calls a very long and good teleſcope; at which time it appeared faint and ſmall with it, though ſtill ſufficiently viſible. Let us ſuppoſe this to have been a teleſcope of 9-feet focal length, with an aperture of 1,65 inch; then, becauſe the diameter of the aperture of a teleſcope ſufficient to render the comet equally viſible ſhould be as the product of its diſtances from the ſun and earth, and the product of the numbers above-mentioned 0,986 and 1,37 is 1,35, we ſhall have the following analogy to find the aperture of a refracting teleſcope ſufficient to ſhew the comet as it appeared to HEVELIUS. As 1,35 : 1,65 inch :: 9 : 11 inches, ſo is the product of diſtances from the ſun and earth to the diameter of the aperture required in inches.